

Statement of

Dr. Arkal S. Shenoy

Director, Modular Helium Reactors

General Atomics

On

**Prismatic High-Temperature Gas-Cooled Reactor Design &
Development**

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Good morning Chairman Klein, Commissioners, panellists, Ladies and Gentlemen.

I am Arkal Shenoy, Director, High Temperature Gas Cooled Reactor Programs at General Atomics. Thank you for the opportunity to speak with you.

General Atomics has a long history with gas reactors and our interest in revival of gas reactors in the U.S. differs from my colleagues in some important ways – General Atomics is not pursuing concurrent water reactor efforts, we are a wholly U.S. owned company, and neither our company nor our gas reactor effort is largely supported by any foreign companies or governments. Currently gas cooled reactor programs are mostly supported by U.S. Department of Energy.

Gas reactors are a necessary part of the nuclear fission solution to the U.S. energy and environmental challenge. General Atomics does not see gas reactors as competition to water reactors for two reasons – first, gas reactors can meet needs such as process heat and hydrogen that are not well suited to water reactors and second, the energy needs of the country over the next decades will be so great that there is more than enough room for both types of reactor plants

Gas reactors or more precisely, Modular Helium Reactors (MHRs) has evolved from Peach Bottom and Fort St. Vrain Reactors designed and built in 1970's by General Atomics. Prior to the collapse of the nuclear power business, GA had sold, but later cancelled 10 HTGRs and had extensive licensing interactions with US regulatory agencies. In early 1980's as a result of congressional house science and technology

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committee guidance the Modular Helium reactor concept was developed which incorporated high degree of safety features based on inherent physics of Reactor Core and not requiring engineered add-on systems. This required to limit the module power and power density and therefore increased cost of heat generation. The MHR is expected to be economically competitive with alternative electricity generation technologies due to the high operating temperature of the gas-cooled reactor, high thermal efficiency of the Brayton cycle power conversion system, high fuel burnup, and expected low operation and maintenance requirements.

The high temperature gas-cooled Modular Helium Reactor can play a vital role in meeting the future energy needs of the United States by contributing not only to the generation of electric power, but also the non-electric energy traditionally served by fossil fuels. The MHR can be integrated to provide different non-electric applications such as Process Steam/Cogeneration for industrial applications including coal conversion, Process Heat for transportation fuel development and Hydrogen Production for various energy applications.

Rather than detailing Modular Helium Reactor developmental history, I will focus my time allocation on two fundamental themes for your attention today. These themes apply to commercial gas reactors, not to any demonstration reactor designed under NGNP which may have additional proof of concept requirements.

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1) NRC consider providing incentive for safety based on inherent physics principles instead of layered active safety systems

The Modular Helium Reactor is not an extension of Light Water Reactor technology. It is its own class of fission energy generation. Current Gas Reactor design strategies are focused on a reactor core that can not melt down – but they don't have to be designed this way. There is a penalty in performance to achieve this. If the Nuclear Regulatory Commission considers this an important feature, it must provide a strong incentive for this feature through significantly reduced requirements and timelines for licensing. This is the only viable incentive source that will result in construction of gas reactors where basic physics ensure safety. What is a strong incentive? When an end user knows that he can get a license for a gas reactor in fraction of the time as a water reactor and he factors that into his purchase decision, then the NRC has provided a strong incentive for inherent safety.

Otherwise, the lack of such incentive will push reactor vendors to provide a more cost effective design that meets current licensing safety thresholds – a step below inherent safety.

2) NRC can take advantage of this new type of advanced reactor to provide a new approach to licensing

General Atomics applauds the NRC's recent efforts to reduce and provide more certainty in the licensing process. The NRC's mission and vision talk about 'the public good' and 'protect the environment.' The NRC should recognize the pressing needs of energy security and environment require an urgent move toward expansion of nuclear

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power use in the United States and the High Temperature Modular Helium Reactor is a needed component of this movement.

How urgent? Some call for the U.S. to reduce its carbon emissions by 50% by 2030.

Assume this burden was to be achieved through nuclear power in the electricity generation and other industrial process heat applications. This would require every future electrical generation facility plus almost 90% of current electricity and industrial process heat requirements to be converted to nuclear. 2030 is only 22 years away.

The Next Generation Nuclear Plant program shows 13 years to build one plant. How many plants would be constructed? The answer varies based on assumptions, but the number of applications would be overwhelming to the NRC given the current review requirements.

One of NRC's strategic outcomes is that no significant licensing or regulatory impediment to safe and beneficial use of radioactive materials. General Atomics is hopeful that the recent progress will result in this strategic outcome being achieved.

The DOE's strategy for Next Generation Nuclear Plant development relies on an alliance of vendors and end users to partially fund the development of the Modular Helium Reactor. With all of the technology and fiscal challenges involved, the two risks that worry the potential alliance members the most are fiscal uncertainty for the DOE's contribution and licensing uncertainty for the NRC. At least the NRC didn't make the top of the list.

This can be solved with a new approach that recognizes that public good is not served if the licensing uncertainty or total time involved results in the reactor not being constructed. An understanding that the environmental and other impacts of continued

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reliance on fossil fuels allows for an evaluation to a set of reasonable standards, but can not support an extended list of sequential emerging requirements. To achieve that end, General Atomics recommends that the NRC consider

- 1) Once its review has satisfied the inherent safety of gas reactor design, descope the associated and not needed reviews. “Because water reactors do it” should not be a permitted statement.
- 2) Outsource the majority of the effort to a qualified private reviewer, with a strong incentive to the reviewer for timely performance and incentive for developing processes that reduce total effort required while ensuring adequate safety.

Focus government effort on what is inherently governmental – final review and approval.

In closing, General Atomics strongly endorses a NRC philosophy in line with its mission “to ensure adequate protection of public health and safety”. Setting the licensing bar so high that reactors, especially advanced gas reactors, are not built or built in severely reduce numbers may provide more margin above ‘adequate protection’ but is not in the best interests of public health or safety. General Atomics supports NRC understanding that it is fundamentally important to our country to move forward decidedly on nuclear power expansion.

Thank you for the opportunity to provide our views on this important subject.

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